Amendments to the Claims:

This listing of claims will replace the claims in the application:

1. (Original) A method of analyzing an engine unbalance condition, comprising:

receiving vibrational data from a plurality of locations distributed over at least one of an engine and a surrounding engine support structure;

inputting the vibrational data into an ANNCV;

using the neural network inverse model, establishing a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine; and

outputting diagnostic information from the ANNCV, the diagnostic information indicating the unbalance condition of the engine.

2. (Original) The method of Claim 1, wherein outputting diagnostic information from the ANNCV includes outputting at least one of an unbalance magnitude and an angular locations as a function of a rotational frequency of the engine.

3. (Original) The method of Claim 1, wherein the vibrational data consist of at least one measurement of component displacement, component velocity, component acceleration, sound pressure, and acoustic noise.

4. (Original) The method of Claim 1, wherein inputting the vibrational data into an ANNCV includes inputting the vibrational data in a time domain format into an ANNCV.

5. (Original) The method of Claim 1, wherein inputting the vibrational data into an ANNCV includes inputting the vibrational data in a complex frequency domain format into an ANNCV.

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6. (Original) The method of Claim 1, further comprising subjecting the vibrational data to a Pre-processing Transformation.

7. (Original) The method of Claim 6, wherein subjecting the vibrational data to a Pre-processing Transformation consisting of a Fourier Transform.

8. (Original) The method of Claim 6, wherein subjecting the vibrational data to a Pre-processing Transformation consisting of Wavelet Transforms.

9. (Currently Amended) The method of Claim 6, wherein subjecting the vibrational data to a Pre-processing Transformation consists of applying a Fourier Transformation that includes framing an FFT block size using the once per revolution ~~rev~~ signal such that leakage effects are at least partially reduced, also known as order tracking.

10. (Original) The method of Claim 6, wherein inputting the vibrational data into an ANNCV includes inputting the vibrational data in a complex domain format into an ANNCV.

11. (Original) The method of Claim 1, wherein outputting diagnostic information from the ANNCV includes outputting fan unbalance and angular location data, and low pressure turbine unbalance and angular location data.

12. (Original) The method of Claim 1, wherein establishing a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine includes establishing a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine using at least one of a multilayer perceptron neural network mode, and a support vector machine neural network model.

13. (Original) The method of Claim 1, further comprising training the neural network inverse model.

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14. (Original) The method of Claim 13, wherein training the neural network inverse model includes adjusting model parameters such that application of a set of inputs and outputs reaches a desired state of definition defined by acceptable error tolerances.

15. (Original) The method of Claim 13, wherein training the neural network inverse model includes inputting vibrational data to the ANNCV generated by an empirical engine model.

16. (Original) The method of Claim 13, wherein training the neural network inverse model includes inputting vibrational data to the ANNCV generated using an engine that is subject to residual unbalances and to applied trial weight unbalances.

17. (Original) The method of Claim 13, wherein training the neural network inverse model includes scaling the vibrational training data prior to inputting into the ANNCV.

18. (Currently Amended) A computer program product for analyzing an engine unbalance condition, comprising:

a first computer program portion adapted to receive vibrational data from a plurality of locations distributed over at least one of an engine~~,~~ and surrounding engine support structure~~, aircraft structure, aircraft component, aircraft cockpit, and aircraft cabin~~;

a second computer program portion adapted to input the vibrational data into an ANNCV;

a third computer program portion adapted to establish a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine using ~~the~~ a neural network inverse model; and

a fourth computer program portion adapted to output diagnostic information from ~~a~~ the neural network inverse model, the diagnostic information indicating the unbalance condition of the engine.

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19. (Currently Amended) The computer program product of Claim 18, wherein the fourth computer portion is further adapted to provide diagnostic information wherein the diagnostic information indicates at least one of a quantity and a position of corrective engine balance weights needed to achieve desirable vibrational characteristics at selected aircraft component and cabin locations.

20. (Original) The computer program product of Claim 18, wherein the fourth computer program portion is adapted to output a vibrational magnitude as a function of a rotational frequency of the engine.

21. (Original) The computer program product of Claim 18, wherein the second computer program portion is adapted to input the vibrational data in a time domain format into a neural network inverse model.

22. (Original) The computer program product of Claim 18, wherein the second computer program portion is adapted to input the vibrational data in a complex domain format into a neural network inverse model.

23. (Currently Amended) The computer program product of Claim 18, wherein at least one of the first, second, and third computer program portions is adapted to subject the vibrational data to a ~~Fast~~ Fourier Transformation.

24. (Original) The computer program product of Claim 18, wherein at least one of the first, second, and third computer program portions is adapted to extract a desired once per revolution vibrational data for order tracking signal processing purposes.

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25. (Original) The computer program product of Claim 18, wherein at least one of the first, second, and third computer program portions is adapted to subject the vibrational data to a Wavelet Transformation.

26. (Original) The computer program product of Claim 18, wherein the third computer program portion is adapted to establish a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine using at least one of a multilayer perceptron neural network model and a support vector machine neural network model.

27. (Original) The computer program product of Claim 18, wherein the third computer program portion is adapted to establish a relationship between the vibrational data from a plurality of locations within one defined area to that of a plurality of locations within another defined area using at least one of a multilayer perceptron neural network model and a support vector machine neural network model.

28. (Original) The computer program product of Claim 18, wherein the third computer program portion is adapted to be trained.

29. (Original) The computer program product of Claim 28, wherein the third computer program portion is adapted to be trained including adjusting model parameters such that application of a set of inputs and outputs reaches a desired state of definition defined by acceptable error tolerances.

30. (Original) The computer program product of Claim 28, wherein the third computer program portion is adapted to be trained including inputting vibrational data generated using an engine that is subject to at least one of residual unbalances and applied trial weight unbalances.

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31. (Original) The computer program product of Claim 28, wherein the third computer program portion is adapted to be trained including scaling the vibrational training data prior to inputting into the neural network inverse model.

32. (Currently Amended) A system for analyzing an engine unbalance condition, comprising:

a control component;

an input/output device coupled to receive vibrational data; and

a processor arranged to analyze the vibrational data, the processor including:

a first portion adapted to receive vibrational data from a plurality of locations distributed over at least one of an engine~~,~~ and surrounding engine support structure~~, aircraft structure, aircraft component, aircraft cockpit, and aircraft cabin~~;

a second portion adapted to input the vibrational data into a neural network inverse model;

a third portion adapted to establish a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine using the neural network inverse model; and

a fourth portion adapted to output diagnostic information from the neural network inverse model, wherein the diagnostic information indicates at least one of the unbalance condition of the engine and information indicating the quantity and position of corrective engine balance weights needed to achieve desirable vibrational characteristics at the plurality of ~~selected aircraft component and cabin~~ locations.

33. (Original) The system of Claim 32, wherein the second portion is adapted to input the vibrational data in a time domain format into a neural network inverse model.

34. (Original) The system of Claim 32, wherein the second portion is adapted to input the vibrational data in a complex domain format into a neural network inverse model.

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35. (Original) The system of Claim 32, wherein at least one of the first, second, and third portions is adapted to subject the vibrational data to a Fast Fourier Transformation.

36. (Original) The system of Claim 32, wherein at least one of the first, second, and third portions is adapted to extract a desired once per revolution vibrational data.

37. (Original) The system of Claim 32, wherein at least one of the first, second, and third portions is adapted to subject the vibrational data to a Wavelet Transformation.

38. (Original) The system of Claim 32, wherein the third portion is adapted to establish a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine using at least one of a multilayer perceptron neural network model, and a support vector machine neural network model.

39. (Original) The system of Claim 32, wherein the third portion is adapted to establish a relationship between the vibrational data from a plurality of locations within one defined area to that of a plurality of locations within another defined area using at least one of a multilayer perceptron neural network model and a support vector machine neural network model.

40. (Original) The system of Claim 32, wherein the third portion is adapted to be trained including adjusting model parameters such that application of a set of inputs and outputs reaches a desired state of definition defined by acceptable error tolerances.

41. (Original) The system of Claim 32, wherein the third portion is adapted to be trained including using vibrational data generated using an engine that is subject to at least one of residual unbalances and applied trial weight unbalances.

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42. (Original) The system of Claim 32, wherein the third portion is adapted to be trained including scaling the vibrational training data prior to inputting into the neural network inverse model.

43. (Original) The system of Claim 32, further including a memory component operatively coupled to at least one of the control component, the input/output device, and the processor.

44. (Original) The system of Claim 32, further including a data acquisition component operatively coupled to at least one of the control component, the input/output device, and the processor.

45. (Original) The system of Claim 44, wherein the data acquisition component includes a plurality of data acquisition sensors.

46. (Currently Amended) A ~~An aerospace~~ vehicle, comprising:

a fuselage;

a propulsion system operatively coupled to the fuselage; and

a monitoring system for analyzing an engine unbalance condition operatively coupled to the propulsion system and at least partially disposed within the fuselage, the monitoring system including:

a control component;

an input/output device coupled to receive vibrational data; and

a processor arranged to analyze the vibrational data, the processor including:

a first portion adapted to receive vibrational data from a plurality of locations distributed over at least one of an engine~~,~~ and surrounding engine support structure~~, aircraft structure, aircraft component, aircraft cockpit, and aircraft cabin~~;

a second portion adapted to input the vibrational data into a neural network ~~inverse~~ model;

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a third portion adapted to establish a relationship between the vibrational data from the plurality of locations and an unbalance condition of the engine using the neural network ~~inverse~~ model; and

a fourth portion adapted to output diagnostic information from the neural network inverse model, wherein the diagnostic information indicates at least one of the unbalance condition of the engine and information indicating the quantity and position of corrective engine balance weights needed to achieve desirable vibrational characteristics at the plurality of ~~selected aircraft component and cabin~~ locations.

47. (Currently Amended) The vehicle of Claim 46, wherein the second portion is adapted to input the vibrational data in a time domain format into ~~a~~ the neural network ~~inverse~~ model.

48. (Currently Amended) The vehicle of Claim 46, wherein the second portion is adapted to input the vibrational data in a complex domain format into ~~a~~ the neural network ~~inverse~~ model.

49. (Currently Amended) The vehicle of Claim 46, wherein at least one of the first, second, and third portions is adapted to subject the vibrational data to a ~~Fast~~ Fourier Transformation.

50. (Original) The vehicle of Claim 46, wherein at least one of the first, second, and third portions is adapted to subject the vibrational data to a Wavelet Transformation.

51. (Original) The vehicle of Claim 46 wherein the monitoring system further includes a memory component operatively coupled to at least one of the control component, the input/output device, and the processor.

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52. (Original) The vehicle of Claim 46 wherein the monitoring system further includes a data acquisition component operatively coupled to at least one of the control component, the input/output device, and the processor.

53. (Original) The vehicle of Claim 52 wherein the data acquisition component includes a plurality of data acquisition sensors.

54. (Currently Amended) The vehicle of Claim 46, further comprising a ~~flight~~ control system disposed within the fuselage and operatively coupled to the propulsion system.

55. (New) A system of analyzing an engine unbalance condition, comprising:

at least one sensor for collecting vibration sensed data;

a processor adapted for receiving, analyzing, and extracting diagnostic information from the sensed data;

a data link; and

a neural network adapted to receive and analyze the diagnostic information from the data link,

wherein the status of engine balance is determined and presented by the neural network.

56. (New) The system of claim 55, wherein the data link further includes a databus and a WiFi circuit.

57. (New) A method of analyzing an engine unbalance condition, comprising:

means for collecting vibration sensed data;

means for receiving, analyzing, and extracting diagnostic information from the sensed data;

means for data linking the diagnostic information; and

means for receiving and analyzing the data linked diagnostic information,

wherein the status of engine balance is determined.

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58. (New) A method of analyzing an engine unbalance condition, comprising:

collecting at least one vibrational data signal from a plurality of sensors distributed over at least one engine and a surrounding engine support structure;

inputting at least one signal into an ANNCV;

analyzing the signal to identify an engine unbalance condition; and

outputting diagnostic information from the ANNCV, derived from the unbalance condition.

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